SOCIETY OF ARTS.

May 1.—T. Winkworth, Esq., in the chair.

The secretary read a paper on the reformed system of laying out and constructing railways, with a view to extending the benefits of the railway system to every part of the United Kingdom.

In 1839 Mr. Wishaw laid his plan of working single lines before the Institution of Civil Engineers, and in 1840, after completing a detailed survey of all the railways in the United Kingdom, and making practical experiments to the extent of 15,000 miles as to the working of the trains on all the British railways at that time open to the public, revised and corrected his plans, and then made it public in the "Railways of Great Britain and Ireland."

Since that period the single way has made considerable progress, and engineers who scouted the idea of carrying on a large amount of traffic by the reciprocating system, are now laying out some of the principal lines on this system in a modified form, and it is understood that the great Holyhead line is to be constructed on this principle.

The mode of working a railway by this plan with any amount of traffic, may be thus described:—

The distances between the terminal and the nearest principal intermediate station, and between the two principal intermediate stations, are 20 miles respectively, which distances are made up of two engine-runs of equal length meeting together at the half-way stations.

To illustrate the mode of exchanging the trains which takes place at the exchange stations nearly simultaneously every hour, we need only describe this process between one of the terminal stations and the first principal intermediate station.

An engine (No. 1) starts from terminal station A, and another (No. 2) from the first principal intermediate station D, as the clock strikes eight, at an average speed of 25 miles an hour, including stoppages; the engines No. 1 and No. 2 will arrive by 24 minutes after eight.

At the exchange station C, where each engine-run is furnished with a large twin-table, capable of holding the engine and tender together, an engine (No. 3) is already on the up-line, ready to proceed with the up-train, and another (No. 4) on the down line, ready to proceed with the down-train.

The engines Nos. 1 and 2 which have just arrived are turned into the engine sheds on either side, and the engines Nos. 3 and 4 are connected with the up and down-trains respectively, and proceed forward precisely at 8 hours 30 minutes, there being six minutes (for the sake of example) allowed for the exchange for attaching or detaching carriages, &c., and for receiving and disembarking passengers.

At 8 hours 54 minutes, engine No. 3 will arrive with the up-train at the arrival platform of the terminal station A, where the passengers and luggage will be dispatched by omnibusses, &c.

In the meantime the nine o'clock down-train is preparing to start with engine No. 5, which has its steam up, and is waiting for the nine o'clock bell to be rung, or bugle-sounded. The clocks at each station throughout are required to be of uniform construction, and by first-rate makers, and regulated twice in 24 hours by means of the electro-galvanic telegraph, which is considered a necessary appendage to all main lines of railway.

At 24 minutes past nine, engine No. 5 will arrive with the second down-train at exchange station C, and engine No. 6 will also arrive within a minute before or after with a second up-train at the same station as on the first exchange; so, again, engines Nos. 1 and 2 are ready to proceed on the signal being given at 9 hours 30 minutes with the up and down-trains respectively; engines Nos. 5 and 6 are turned into the engine-sheds as before, and prepared to make the next exchange at 9 hours 54 minutes; engine No. 1 arrives at the terminal station A, as before, and engine No. 3 is again ready to start with the ten o'clock train, and so the reciprocating process is continued throughout the 24 hours at each of the intermediate exchange stations.

Intervals of one hour each for the starting of the trains, and also ten-mile runs are taken, merely for the sake of easy illustration, but intervals of 90 minutes, which would give 16 daily trains, and longer runs, according to each particular case, would answer equally well.

The estimated cost of construction of a line 60 miles in length, taking the prices throughout on a liberal scale, is, including stations, furnishings, plants, &c.:—

Total cost of constructing the railway and stations	£824,787	8	2
Total cost of furnishing the railway and stations	101,320	0	0
	£926,107	8	2

Or, altogether, at the average rate of only 15,435*l.* 2*s.* 5*d.* per mile.

The annual revenue, with the amount of traffic, would amount to 324,339*l.* 1*s.* 4*d.*; and the annual expenses, including fund for depreciation of locomotives and stock, &c., and interest on loans, &c., 115,879*l.* 18*s.*

Thus the disbursements would amount, on an average, to 35·72*l.* per cent. on the gross revenue.

The English railways at present in operation extend to	1,608 miles.
The Scotch, ...	219 „
The Irish, ...	80 „
Making a total of	1,907 „

If the reciprocating plan had been adopted, the total cost of all the British railways at present open to the public would only have been 29,434,345*l.*, instead of considerably more than double that amount.

In 1841, Mr. Whishaw laid down on his railway-map the lines requiring to complete the system throughout England, Scotland, and Ireland; from which it appears that

In England there remained to be constructed	1833 miles.
In Scotland, ...	210 „
In Ireland, ...	931 „
Making altogether	2974 „

Which, if executed on the reciprocating system, would not exceed 45,903,690*l.*, instead of 91,807,380*l.* if the ordinary double way be adopted.

The latter part of this paper was devoted to a consideration of the atmospheric system of railways, giving an account of its progress from the publication of Mr. Ballence's plan in 1824 to the present time.

The next paper read was by Mr. Galt, who has lately been examined before a committee of the House of Commons on his plan for railway reform.

The value, says Mr. Galt, of all the railway property in the United Kingdom is estimated at 93,000,000*l.*, the price at which it could be purchased would pay 4*l.* 7*s.* per cent.; and as government could borrow money at little more than 3 per cent., there would be a clear profit of 1,165,000*l.* per annum, to be applied by government to meet the loss which would be incurred by a reduction of fares.

INSTITUTION OF CIVIL ENGINEERS.

April 30.—The President in the chair.

"A Description of the method employed for Repairing a Chimney 120 feet high, at Messrs. Cowper's Cotton Mills, Glasgow," by Joseph Colthurst, was read. The means adopted were thus described:—the workman was provided with a broad leathern belt, to which was attached a strong spring-hook; staple-shaped ladder-irons, with flat gagged ends, were driven into the joints above each other, at intervals of 15 inches, by the man standing in them in succession as he ascended, until he reached the top; his safety was secured by fixing the spring-hook into the ladder-iron immediately opposite his waist, which enabled him to use both his hands when working, a rope was also passed round his waist and down inside the ladder-irons, to support him in case one of the irons broke or drew out; he thus succeeded in removing some ornamental plates of iron which had been loosened by a storm. In descending, the workmen took the ladder-irons out one after the other, the whole operation being performed in two days and a half. The total cost, including a bonus of 5*l.* to the workman, was only 13*l.*

The first part of a paper by Mr. W. Fairbairn, on the reduction of the magnetic ores of Samakoff (Turkey) was read; it commenced with reviewing the few attempts which had been made towards improving the method of treating the richer iron ores both of England and of foreign countries, the great English iron makers having restricted themselves to using the lean carbonates of iron, on account of the facilities they offered for working; the great advantages which might have resulted, both in the quantity and the quality of the metal produced from rich ores, have thus been neglected.

It is stated that Mr. Dhannes Dadian, an active and enterprising Armenian in the service of the Sublime Porte, brought to this country specimens of the magnetic iron ore and of bituminous coal found in the district of Samakoff, in Turkey. He had them analyzed at Paris and in England, and found that the ore was nearly a pure oxide of iron, containing about 63 per cent. of metal; that it was free from sulphur, arsenic, or other deleterious matters; and that there was mixed with it about 12 per cent. of silicious earth.

The ore was described as being found in the form of a fine sand covering extensive plains, where it had been deposited to the depth of several feet, probably by the action of water upon the mountains around, where a similar ore existed in considerable masses. In consequence of the favourable report of the assayists, and acting on the advice of Mr. Fairbairn, Mr. Dhannes Dadian determined to persevere in his projects, and his attention being directed to the process invented by Mr. Clay for producing malleable iron direct from the ore, as described in a paper read at the Institution of Civil Engineers, February 14, 1843, he secured that gentleman's services to conduct some experiments, and subsequently engaged him to proceed to Turkey to prosecute the working of the iron ore on an extensive scale.

Mr. Clay's report, and that of Mr. League, were fully given; they contained details of the various ingenious modes employed to work the ore, which, being in the state of a fine sand, either fell unmelted through the fire into the bottom of the furnace, or was blown out of the furnace-top by the force of the blast; at length Mr. Clay, thinking that if the ore could be densadized by a previous operation, it would be in a fitter state for fusion in the blast-furnace, submitted it to a partial process, as far as causing it to form into lumps; in that form it was easily fused, and produced cast-iron of a peculiarly ductile fluid, and yet strong character, of which specimens were exhibited. The success of this plan was considered so complete, that the preparations were immediately commenced for erecting works in Turkey on a large scale.

Incidental to the subject of the glassy scoriæ of the iron furnaces, Mr. Clay mentioned that he had studied carefully the composition of crown-glass; he believes that he was the first to point out the true atomic character of glass, that its quality depends on the ingredients being compounded in certain definite atomic proportions, and that crown-glass is quinquisilicate of lime and soda. He arrived at these conclusions in the year 1837; and, at the works of Messrs. Chance at Birmingham, it was found, that no following the rules he laid down, the production of a constant quality of glass was inevitable. He then treated of the production of optical lenses and of the make of bottle-glass. The paper then returned to the forms of the furnaces proposed for working the Turkish iron ore; the various modes of treating it, and the nature of the flukes, &c., concluding the first part of the paper, with the details of the experiments made upon it at Manchester and at the Backbarrow works.

The following papers were announced to be read:—

No. 679. (Second part.) "On the relative strength and other properties of cast-iron from the Turkish and hoematile ores," by W. Fairbairn, M. Inst. C.E.

No. 675. "Description of a pair of iron Lock-gates, constructed in 1843, for the entrance of the west dock at Montrose," by J. Leslie, M. Inst. C.E.

No. 678. "Description of a coffer-dam used for closing the end of the Building-slip at her Majesty's Dockyard, Woolwich," by B. Snow, Assoc. Inst. C.E.

No. 670. "Account of the plan adopted by William Preston White, for raising the